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GB 1404876	US 3718252

(58) Field of search
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B3N

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(54) A magazine strip for screws and a unit for driving-in screws

(57) A relatively rigid rod or magazine strip 1 has longitudinally spaced through holes 2 for screws 3 and is of a material, e.g. foamed polystyrene, which is compressible and/or abradable and/or can be broken off and has a thickness D of several turns of threads.

A driving-in unit for screws comprises a drivable screwing tool 101, a telescopic spring-loaded tool feed guide 103 and a screw magazine strip delivery device 104, the longitudinal central axis of which is aligned with and extends transversely to the axis of the screwing tool 101. The feed guide 103 and screwing tool 101 are on spaced parallel axes. The drive unit 102 of the screwing tool 101 and a part 109 of the feed guide 103 are connected by a common first cross member 108. A second cross member 110, spaced from and parallel to the first cross member 108 is securely connected to the other part 112 of the feed guide 103 and has a through bore 111 for the screwing tool 101. The delivery device 104 with a delivery channel for the magazine strip 106, with screw stop surfaces and dogs 131, 132 and with a spring feed for the magazine strip 106, as well an abutm nt surface 144 for positi ning th driving-in unit during use, are mounted or formed n this second cross m mber 110.

Fig.1

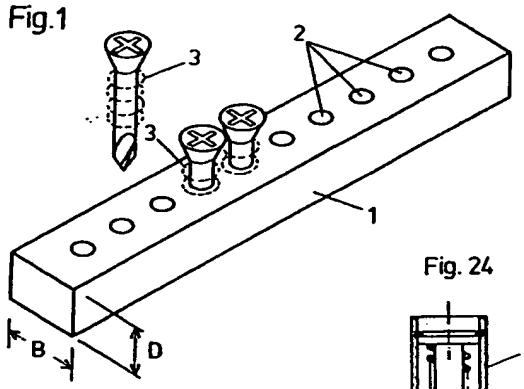

Fig. 24

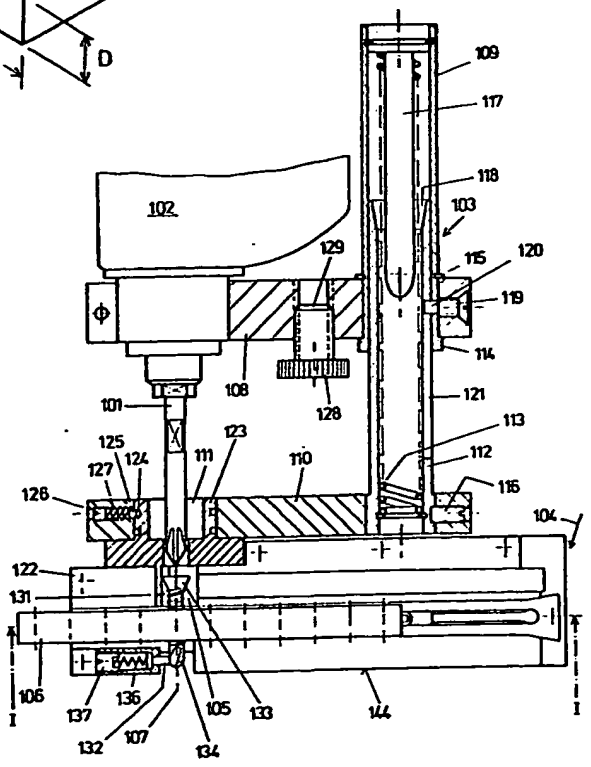

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Fig.1

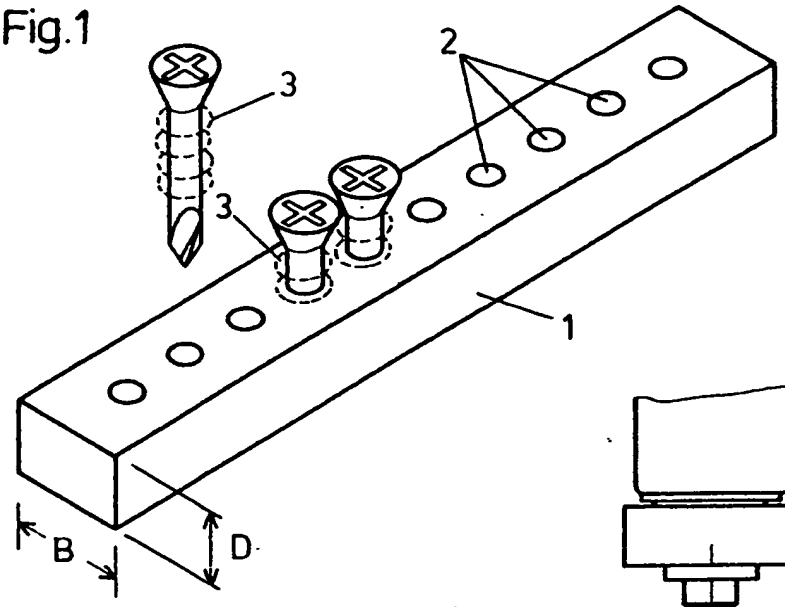

Fig.2

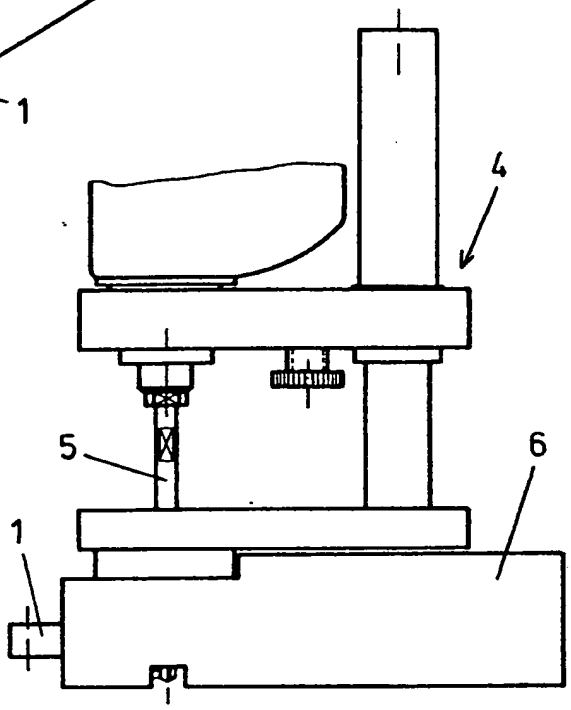

Fig.4

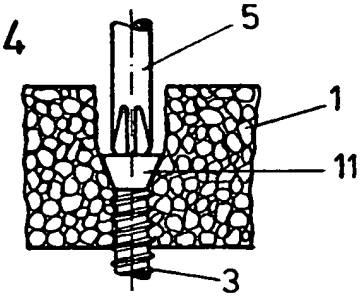

Fig.6

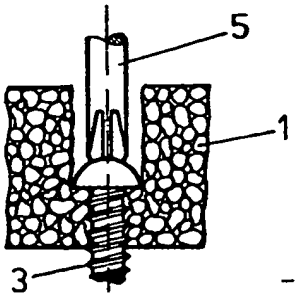

Fig.3

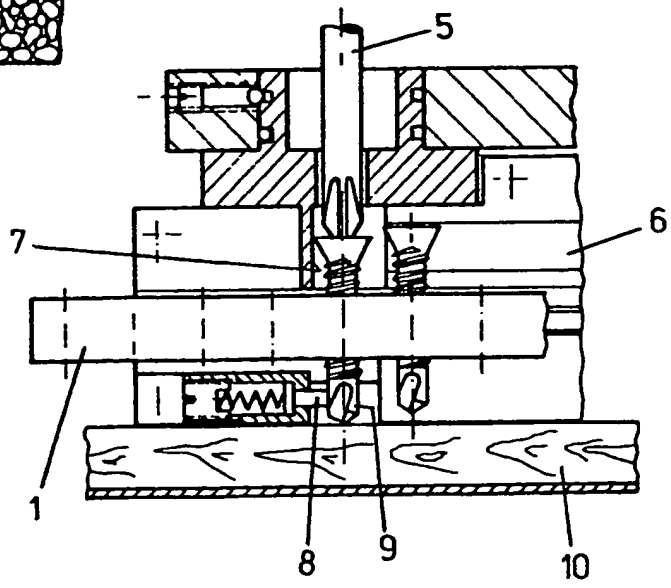

Fig.5

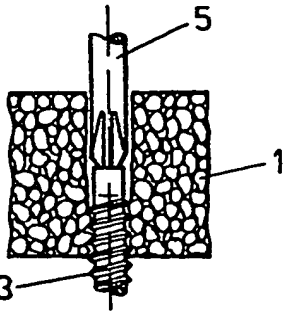

Fig.7

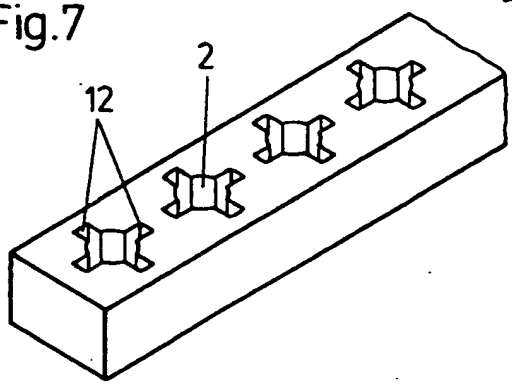

Fig.9

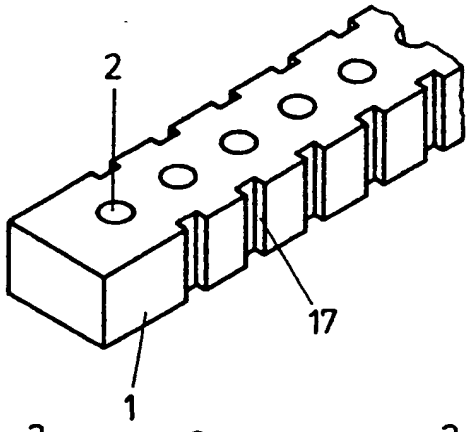

Fig.8

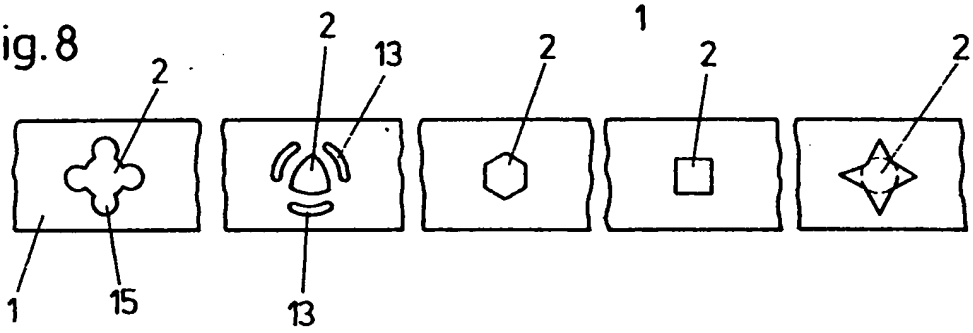

Fig.10

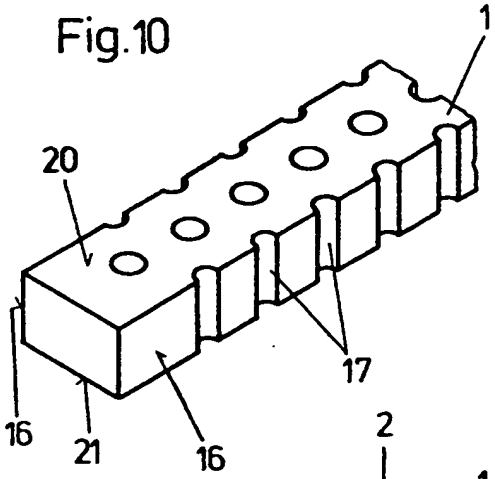

Fig.11

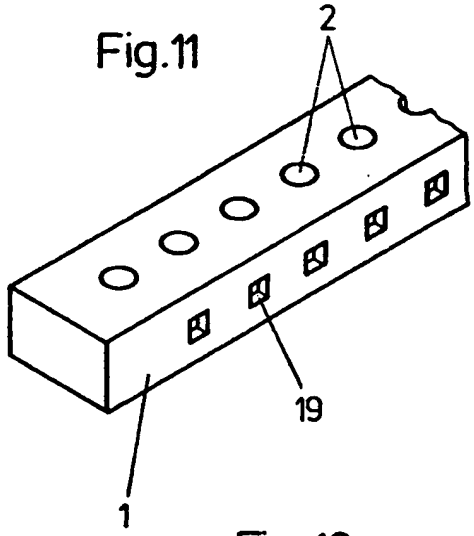

Fig.12

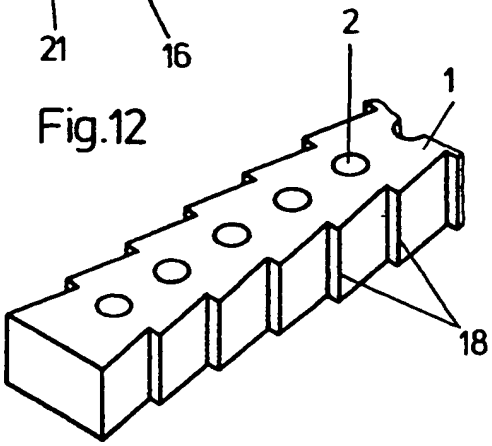

Fig.13

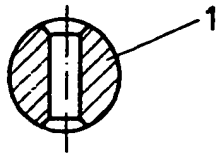

Fig. 14

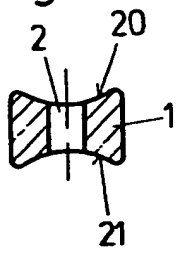

Fig. 15

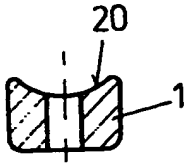

Fig. 16

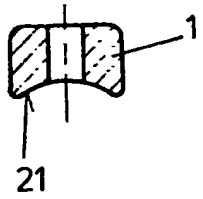

Fig. 17

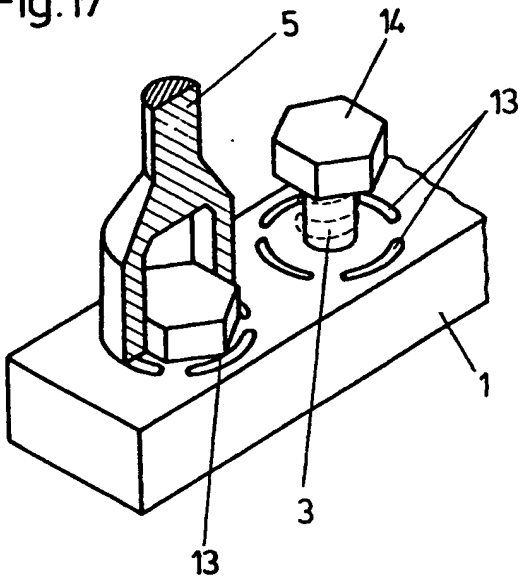

Fig. 18

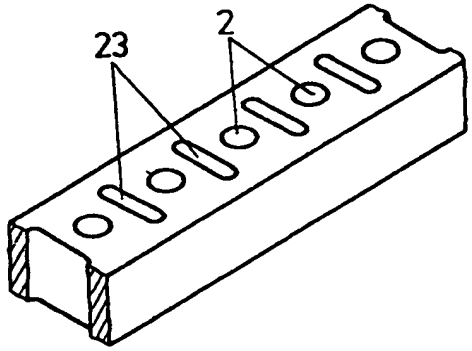

Fig. 19

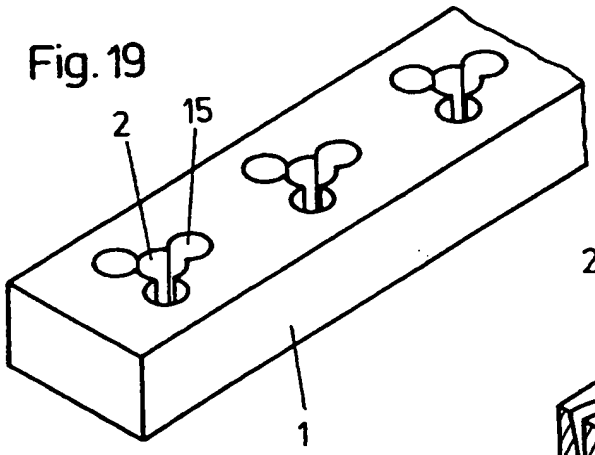

Fig. 20

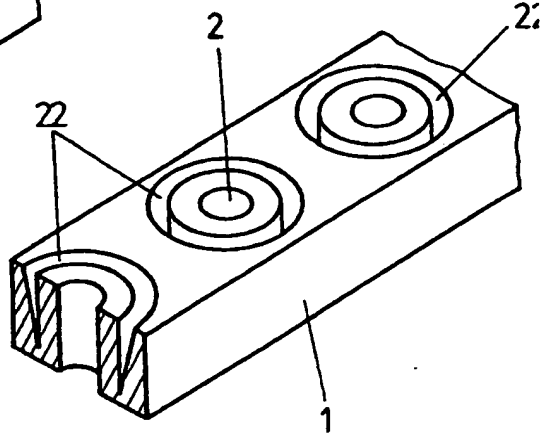

Fig. 21

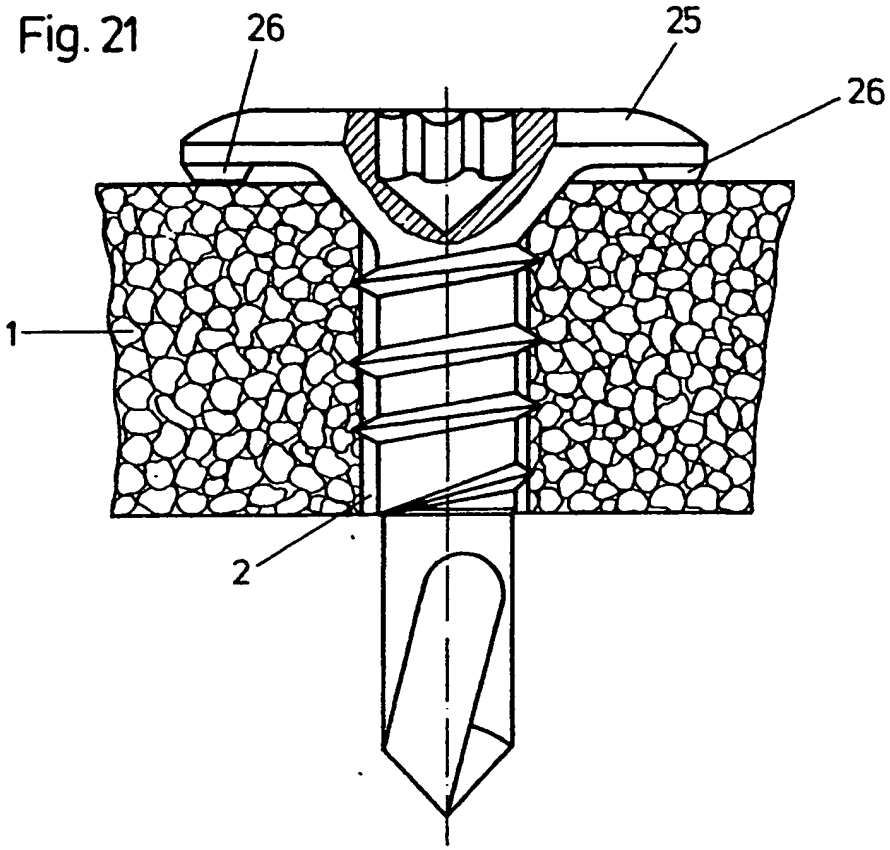

Fig. 22

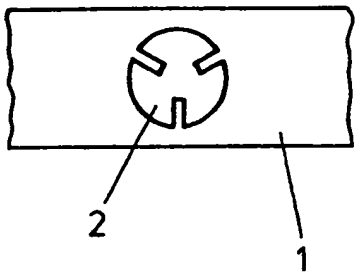

Fig. 23

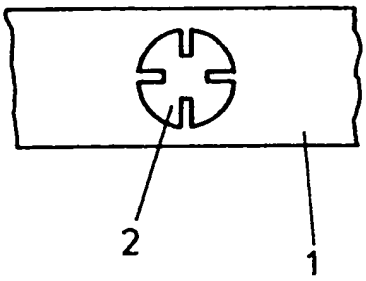

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Fig. 24

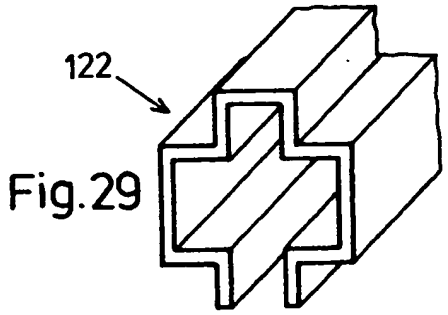


Fig. 29

Fig. 27

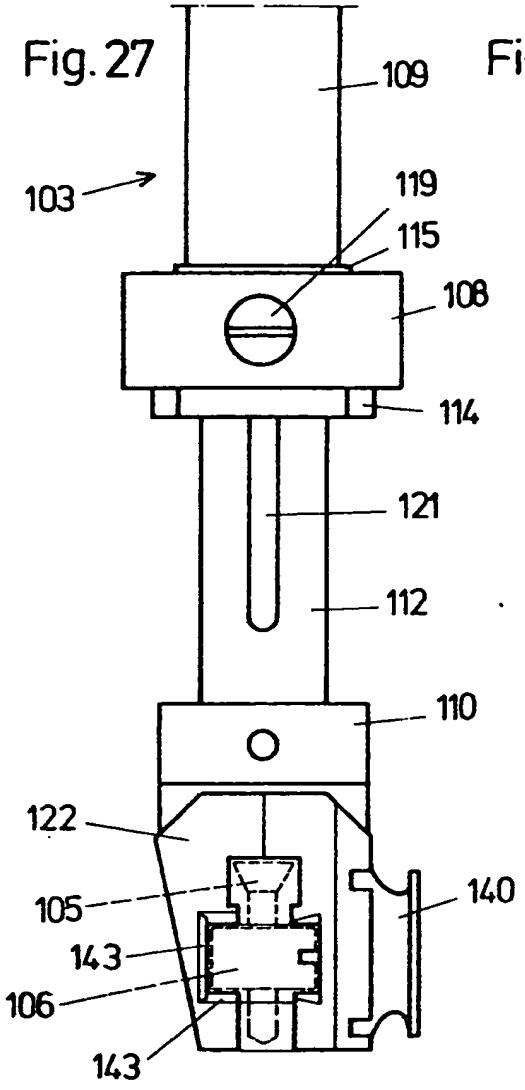


Fig. 28

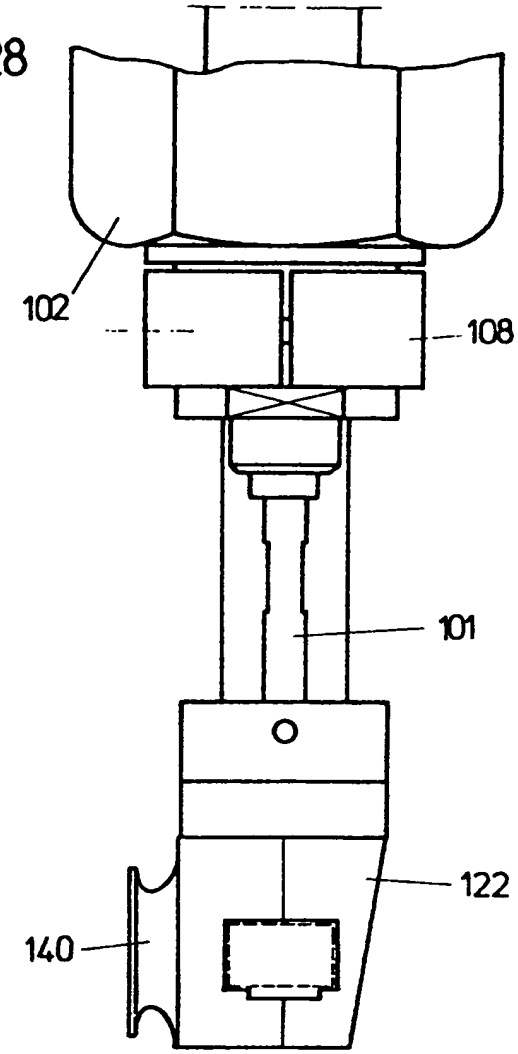


Fig. 25

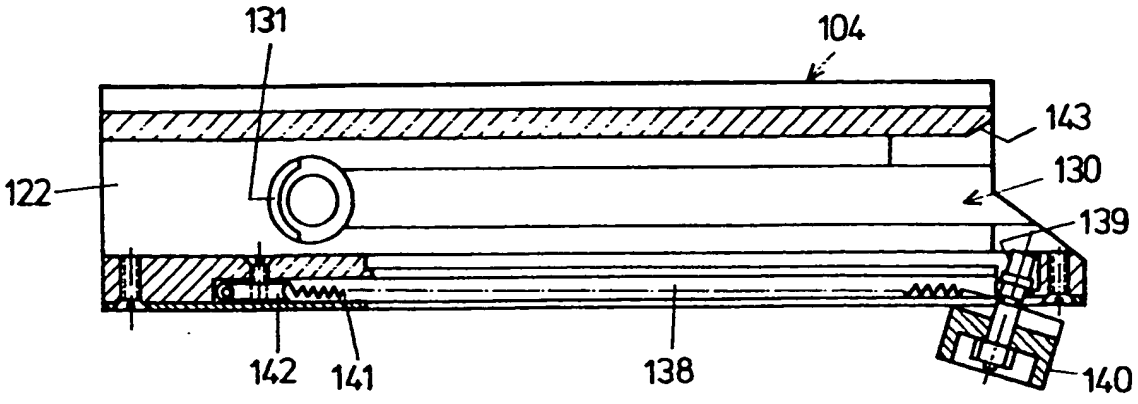
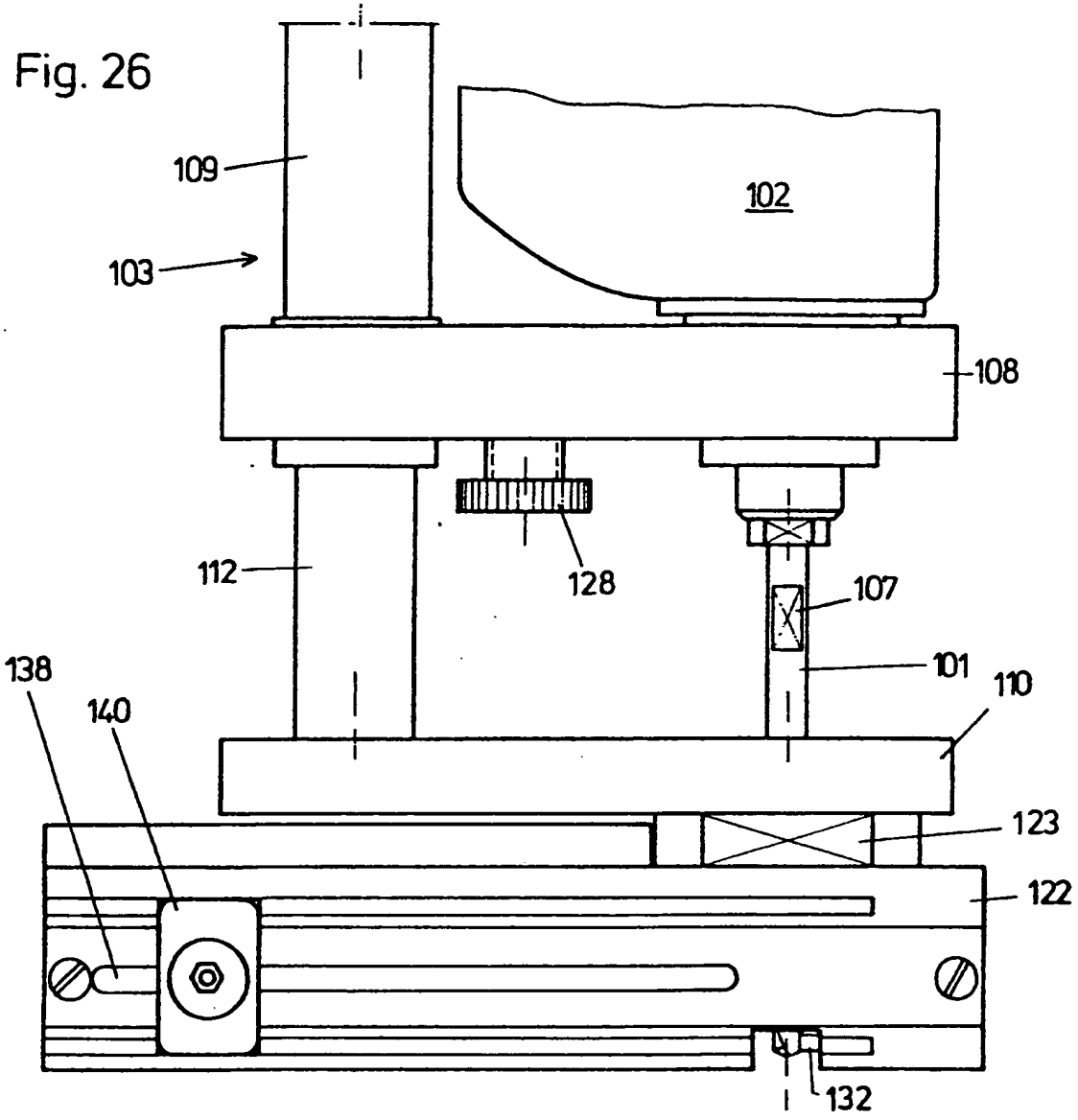


Fig. 26



SPECIFICATION

A magazine for screws and a unit for driving-in screws

The invention relates to a magazine strip for screws with through holes spaced apart successively in the longitudinal direction of the magazine strip for the insertion of screws, and also to a driving-in unit for the screws delivered in the magazine strip, comprising a screwing tool which can be driven, a spring-loaded feed guide and also a delivery device for the screws, the longitudinal central plane of which is aligned with the axis of the screwing tool.

A plurality of design variants for magazine belts or strips are known, which are able to accommodate a plurality of screws and which can be rolled up. However, for operational reasons such long magazine strips can only be used where the driving-in unit can be supported on the ground, since the plurality of screws inserted therein represent a considerably weight. Therefore, such magazine strips only serve for holding screws and cannot be used for accurate positional location in the driving-in unit. The axial alignment of the screws is not accurate in such magazine strips.

When screwing in or driving in self-tapping screws, exact alignment of the screw to the axis of the screwing tool is necessary and, moreover, in the case of manually operated tools, which are used also for wall and ceiling installation, it is necessary to reduce the overall weight as much as possible.

The subject of the invention is a magazine strip, with which simple loading with screws is possible, which can be simply conveyed and introduced into a driving-in unit and in which, moreover, accurate retention of the screws in the driving-in unit is ensured.

In accordance with the invention the magazine strip, as a bending-resistant section member, is made from material which is compressible and/or abradable and can be broken off, and in axial direction of the through holes is of a thickness extending over several turns of thread.

Since the magazine strip is produced from relatively rigid material, simple loading of the magazine strip with screws is possible, this loading being effected, for example, by pressing the screws into the through holes. The magazine strip is resistant to bending and can thus be rapidly loaded into a driving-in unit. Insertion into a corresponding delivery channel in the driving-in unit and also guidance therein can be accomplished particularly easily.

Since the thickness of the magazin strip is so chosen that the inserted screws are retained by way of several turns f the thread, secure and accurat alignment of th screws inside th magazin strip and thus also in the driving-in unit is nsured, in which case an inserted screw is afforded guidance until it has been effectively screwed home.

Since the material of the magazine strip is compressible and/or abradable, in simple manner the possibility is off red for the scr w, optionally provided with a head, to be screwed hom thr ugh th magazine strip, without the material f the strip offering any particular obstruction.

A particular advantage is also achieved if the magazine strip is made from material which can be broken off so that, for example, the empty portion of the magazine strip, which protrudes from the driving-in unit, can readily be removed by being broken off. This is particularly important when work has to be carried out, for example, in a corner of a room or in other places with difficult access.

By designing the magazine strip as a binding-resistant section member, the magazine strip is of course only of corresponding length, so that the weight of the inserted screws in relation to the total weight, including the driving-in unit, is insignificant. Furthermore, because of the possibility of rapid reloading with such a bending-resistant section member, in practice no delays occur in operating time.

Various embodiments of driving-in units for screws are also known. However, they are of relatively great overall length and are of corresponding weight, thereby making it difficult to work in particular on a wall or ceiling. Furthermore, a complicated mechanical construction results therefrom, especially as a spring-loaded feed guide and also the screwing tools are aligned coaxially with one another and thus have to be nested coaxially one inside the other. Moreover, since the delivery means for the screws is provided in the immediate vicinity of the screwing tool, handling difficulties arise when changing the screwing tool or when other faults occur. However, the most significant problem is the considerable overall length and considerable weight, especially as single-handed working should as a rule be possible during screwing operations on a wall or a ceiling.

Therefore, a further subject of the invention is a driving-in unit which is of short overall length, viewed in the axial direction of the screwing tool, which is of relatively low weight and in which ease of handling is ensured in every respect; above all it is to be loaded with magazine strips as have been described above.

According to the invention the parts of the feed guide which can slide one inside the other are disposed in *per se* known manner axially parallel to and at a distance from the screwing tool, and the drive unit of the screwing tool and a part of the feed guide are mounted or formed on a common first, freely projecting cross member, a second freely projecting cross member, provided at a distance from this first cross member and aligned parallel thereto, is securely connected to the other part of the feed guide and has a through bor for the scr wing tool, and the delivery device with a delivery channel for the scr ws held in a magazine strip, as well an abutm nt surface for positi ning the driving-in unit during use, ar mounted or formed on this second cross member.

As a result of these features according to the invention it is possible to provide a small manage-

ble driving-in unit which can b operated with ne hand. Therefore it is easily possible to position the driving-in unit at any place desired, even during one-handed operati n. Becaus th entire structure is very short as a result of the features according to the invention, a small moment is exerted on the operator's arm. Because of its small and manageable construction, a driving-in unit of this type can be used in places with poor access, in the corners of a room etc.

Since the space between the two cross members is left free in the immediate vicinity of the screwing tool, simple changing of the screwing tool is possible. The constructional cost is very low since not all the parts have to be stacked coaxially on one another.

Nevertheless, corresponding length is provided for the feed guide, since it can easily be directed rearwards laterally close to the drive unit of the screwing tool.

Embodiment of the invention will now be described with reference to the accompanying drawings, of which:

Figure 1 shows an oblique view of a magazine strip with inserted screws;

Figure 2 shows a partial view of the driving in unit, and

Figure 3 shows a partial section through such a driving-in unit, illustrated during a driving-in operation;

Figures 4 to *6* shows sections through a magazine strip, showing screws being screwed through this magazine strip;

Figures 7 and *8* show magazine strips in oblique view and in plan view, illustrating different cross-sectional shapes of the through holes;

Figures 9 to *12* show different embodiments of the design of the lateral boundary surfaces of the magazine strip;

Figures 13 to 16 show magazine strips with different cross-sectional shapes;

Figure 17 shows a magazine strip which can be used for screws with peripheral engagement;

Figures 18 to *20* show, partly in section, further embodiments of the magazine strip in oblique view;

Figure 21 shows a screw of special construction inserted in a magazine strip;

Figures 22 and *23* show further embodiments of the cross-sectional shapes of the through holes in the magazine strip;

Figure 24 shows a section in the region on the longitudinal axis of the driving-in unit;

Figure 25 shows a section along the line I-I in Figure 24;

Figure 26 shows a view of the driving-in unit from the rear, in relation to Figure 24;

Figure 27 shows a view of the driving-in unit from the right in relati n to Figure 24;

Figure 28 sh ws a view of th driving-in unit from th left in relation to Figur 24; and

Figure 29 sh ws a cross-secti n through a special embodiment of th deliv ry device.

Figure 1 illustrates a magazine strip 1 which is of rectangular cross-secti n and which is designed as a bending-resistent section member. Through holes 2, into which screws 3 can be inserted, are pr vided spaced apart in the longitudinal direction of this magazine strip 1.

The magazine strip 1 consists of a material which is compressible and/or abradable and can be broken off. It has been demonstrated that in particular an expanded polystyrene foam can be used. The magazine strip 1 is thus relatively bending resistant but can, if necessary, be compressed and/or the through holes 2 can be correspondingly reamed so that it is readily possible even for headed screws to be screwed through such a magazine strip, without the magazine strip thereby being destroyed. The wall material of the through holes is thereby merely compressed and/or slightly abraded, so that also no interference occurs in the operation of the driving-in unit.

The thickness D of the magazine strip extends over several turns of the thread of the screws 3 to be inserted, so that secure guidance of the inserted screws 3 is ensured upon being introduced into the driving-in unit and also during the screwing-in operation. With respect to a dimensional relationship, as illustrated for example in Figure 1, the thickness of the magazine strip 1 extends at least over three turns of the thread.

It has been found to be very advantagous if the ration of thickness D to width B is approximately 1:1.5. This provides sufficient bending-resistant strength. It is most advantageous if the through holes 2, which in the embodiment according to Figure 1 take the form of through bores, correspond approximately to the core diameter of the screws 3 to be inserted. Satisfactory retention of the screws is thereby ensured while at the same time affording easy loading of the magazine strip 1, since because of the material chosen the screws merely have to be pressed in. Therefore simple automatic magazine loading is possible which, of course, may also simply be carried out by hand.

The illustrated driving-in unit 4, which will be illustrated and discussed in detail below, is provided *inter alia* with a screwing tool 5 and a delivery device 6. The magazine strip 1 is pushed into the delivery device 6, the special shape of the magazine strip 1 enabling satisfactory guidance to be ensured. The screws then abut against stop members 7 and 8 so that they are aligned coaxially with the screwing tool 5. As a result of the satisfactory retention in the magazine strip 1 it is also ensured that the screw cannot be deflected to one side during a screwing-in operation. If, for example, self-tapping screw 3 is used, this screw 3 will firstly be displaced by the screwing tool 5 until its drilling tip 9 encounters the corresponding workpiece 10. During the subsequent drilling and then screwing-in operation, th screw will continue to be guided in this relatively thick magazine strip, so that it is possible to reliably prevent any tilting of the screw. Because of the special material of th magazine strip 1 it is als p ssible f r the head to be rotat d right through this magazin strip, with ut any possibility of malfunctions occurring inside the deliv- ry device 6. It is also evident that th mptied

portion of the magazine strip 1 emerges outwardly on the other side of the delivery device 6 and, if necessary, can be broken off, for example when working in the corner of a room or in other not easily accessible places. Therefore, the projecting portion can simply be removed by thumb pressure.

It is evident from Figure 4 that when the screw 3 is being screwed through, the following screw head 11 compresses and/or slightly abrades or rubs away the material of the wall of the through holes 2, without thereby destroying the magazine strip 1 itself. Tests have shown that other head shapes can be readily rotated through a magazine strip 1 of this type without the magazine strip being destroyed. This is valid, for example, in the case of a hemispherical head shape according to Figure 6. Of course, no problems arise in the case of stud screws, in which the engagement end for the screwing tool is smaller than the threaded diameter (Figure 5), and it is ensured that sufficient guidance is provided for the screw during the screwing-in procedure. Both pushing through and threading through are readily possible.

Tests have revealed that with a ratio of head diameter: external diameter of the screw of 3:1, no difficulties arise in rotating the screw right through the magazine strip 1.

The magazine strip according to the invention thus not only has a magazine function but it also ensures that the screws are admitted arranged coaxially to the axis of the screwing tool and are guided in the magazine strip until screwing-in commences. It is thereby possible for the usually necessary claw-type guide means for the screws to be dispensed with in a driving-in unit. Substantially lower wear of the screwing tool is also to be expected, especially as proper alignment of the screws is provided.

A further important advantage also lies in that the magazine strip consisting of the material provided in accordance with the invention is very light and that only a small amounted of material is required which, moreover, can be produced inexpensively.

In all embodiments of the magazine strip according to the invention, the through holes 2 have a free passage cross-section approximately corresponding to the core diameter of the screws 3 to be inserted. Secure retention of the screws is ensured thereby. However, different embodiments of the cross-sectional shape and arrangement of the through holes are possible, which vary from the cylindrical shape.

In the development according to Figure 7, starting from the free passage cross-section of the through holes 2, radially outward directed grooves 12 are provided so that the inserted screw has only zonal contact. An embodiment of this type would be particularly advantageous for screws of large diameter or if a particularly large screw head is provided.

Figure 8 illustrates a number of cross-sectional shapes for the through holes 2, linear contact of the screw being provided in all embodiments, that is three or more times over the periphery thereof. Instead of grooves, such as those shown in Figure 7, it is also possible to provide radially outward directed recesses, pockets and so on of widely varying cross-section. In the second example according to Figure 8, it is illustrated that arcuately extending slot portions 13 can be provided coaxially to the through holes 2 for accommodating screws, which slot portions pass right through the thickness of the magazine strip. Therefore, weakening zones are provided in this region and this embodiment is especially advantageous in the case of a particularly large screw head and, possibly, if the screw head is provided for peripheral engagement, A similar embodiment is evident from Figure 17, in which the magazine strip 1 holds screws 3 with a hexagonal head 14. The screwing tool 5 is then designed with a hexagonal socket, in which case in order to screw down this screw 3 the screwing tool 5 has for force its way through the magazine strip 1. Again this is made possible by the particular choice of material for the magazine strip 1 and by the presence of these arcuate slots 13.

A variant of the first example according to Figure 8 is evident from Figure 19, wherein three such recesses 15 are provided instead of the four recesses 15.

In the embodiment according to Figures 10, 11 and 12, grooves 17, ribs 18 and openings 19 are provided, which in adaptation to the driving-in unit can be used for the advance of the magazine strip. In place of the embodiments shown here, corresponding projections could also be disposed on the boundary surfaces 16. Of course, it is also possible for such ribs, grooves, openings, projections are the like to be provided only on a single boundary surface. It would also be possible for such indentations or projections to be formed on the upper side 20 or underside 21 of the magazine strip, instead of on the two lateral boundary surfaces 16.

In the above-described embodiments, the magazine strip 1 is of rectangular cross-section. Of course, other cross-sectional shapes could be provided here; however, the possibility of longitudinal guidance within the driving-in unit must be present. In the embodiment according to Figure 13, the magazine strip 1 is of circular cross-section. With this arrangement it is, of course, necessary to provide in the driving-in unit guide means which correspondingly engage the projecting screw portions above and/or below the magazine strip for guidance purposes. In the embodiments of Figures 14 to 16, the upper or lower boundary surface, respectively 20 and 21, are formed as a concave depression extending in the longitudinal direction of the magazine strip 1. In the embodiment according to Figure 14, both boundary surfaces 20 and 21 are of concave shape, viewed in the cross-section of the magazine strip 1, while according to Figure 15 only the upper boundary surface 20 and according to Figure 16 only the lower boundary surface 21 is so shaped. An improvement in the bending resistance of the magazine strips is thereby attained and, moreover, the sliding friction inside the driving-in unit is reduced during the feed of the

magazine strip 1. Of cours , other embodiments and cross-sectional shapes of the magazine strip are possible. However, there is still the requirement for production from the corresp nding material and for corresponding thickness, viewed in the axial direction of through holes 2.

Figure 20 shows an embodiment of the magazine strip 1, wherein peripherally closed grooves 22 extending coaxially to the through hole 2 are provided, the depth of which grooves corresponds only to part of the thickness D of the magazine strip 1. There grooves are advantageously of wedge-shaped, downwardly tapering cross-section. An embodiment of the type shown in Figure 20 is used advantagously when a screw with peripheral drive and a screwing tool 5 with internal drive are provided, as illustrated in Figure 17. In an embodiment of this type the magazine strip is, of course, of correspondingly wider construction, since the screwing tool 5 has to pass through the magazine strip 1 upon screwing-in the screw. The screwing tool then pushes away the remaining ribs or annular parts surrounding the through holes 2, in which case these separated pieces are ejected at the underside of the driving-in unit during each screwing operation.

In the embodiment of Figure 18, transverse slots 23 extending transversely to the longitudinal extension of the magazine strip 1 are provided between the through holes 2 shaped apart successively, which slots extend over part of the width of the magazine strip and, preferably, pass right through the thickness thereof. With such a development the possibility is offered that for a peripherally engaged screw (for example with a head as in Figure 17) the corresponding portion is detached and destroyed when screwing-in takes place. When such an embodiment with transverse slots 23 is used for screws with internal drive and relatively small head, there is then the possibility of being able to break off more easily the portion of the magazine strip protruding beyond the driving-in unit.

In Figure 21 a screw 25 of special construction is inserted in a magazine strip 1. The through holes 2 in the magazine strip 1 may be in the form of bores or they may have different cross-sectional shapes corresponding to the above-described examples. It would also be possible, precisely for such a design of a screw 25, to provide a cross-section for the through holes 2 corresponding to the examples according to Figures 22 and 23. The threaded portion of the screw 25 is in practice, then supported at a number of points in which case only a small amount of material has to be forced out to effect penetration of the screw head.

The screw 25 has a relatively large head diameter, the screw nevertheless having to be retained securely in th magazine strip 1 until screwing-in takes place. Th refore, when the head of th screw 25 penetrates through the magazin strip 1 a substantially enlarged opening is produced in relati n to the through hole 2. In order to effect easy removal of th material of the magazin strip 1 here, knob-like radially spaced projections 26 are provided on the und rside of th screw head, which in practice abrade th material of the magazine strip 1 while passing therethr ugh. Any jamming of material particles of the magazine strip 1 under the screw head is thereby effectively prevented. These projections 26 are substantially more effective than would be the case with a cutting edge at the periphery of the screw head. These projections 25 primarily prevent a whole circle being detached from the magazine strip 1. The projections act in similar manner to a milling cutter and they destroy a portion of the magazine strip 1 when the drilling tip of the screw 25 is screwed home. Of course, care must be taken to ensure that the projections 26 are not too sharp, because otherwise the magazine strip would be ruptured during penetration.

With a view of the reliable operation of the driving-in unit, the peripheral contour of the magazine strip 1 should in fact be maintained even after the screw head has been rotated therethrough. In place of projections 26, it would of course also be possible to provide corresponding ribs, conical spikes, hemispherical protuberances etc.

The magazine strip according to the invention thus provides important advantages both with regard to loading of the magazine itself and with regard to handling in a driving-in unit, which advantages cannot be achieved even approximately with the hitherto known magazine strips. Of course, various possibilities are offered for modifying the cross-sectional shape of the magazine strip or the shape of the through holes; however, in such cases it is still necessary to comply with the basic prerequisites of the present invention. Within the scope of the invention it is also possible to use in place of the proposed material, namely expanded polystyrene foam, a different material having the same or a least approximately the same properties.

In the following, the driving-in unit itself will be described in detail, which is advantagously loaded with the above-described magazine strip, but without restricting the use of this driving-in unit only to magazine strips of the type just described. By means of such a driving-in unit the screws delivered by way of the magazine strip are screwed in at the desired location, so that the expression screwing-in unit would also be appropriate for the apparatus explained below.

The driving-in unit substantially comprises a screwing tool or bit 101, which is driven by a motor 102, a spring-loaded tool or feed guide 103 and a delivery device 104 for screws 105 which are delivered by means of a magazine strip 106.The longitudinal central plane of the delivery device 104 is aligned with the axis of the screwing tool 101.

The parts of the feed guide 103 which can slide ne inside the ther ar disposed axially parallel t and at a distance from th screwing t l 101. On a first cr ss m mber 108 there is mounted the drive unit f r the screwing tool 101 (motor 102), a clamp-type m unting being provided by a locking screw. A part 109 of th feed guide 103 is securely connected to this first cross member 108.

At a distance form this first cross member 108

and align d parallel thereto there is provided a second cross member 110 which has a through bore 111 for the screwing tool 101. The delivery device 104 and also another part 112 of the feed guide 103 is mounted on this second cross member 110.

The two parts 109 and 112 of the feed guide 103 are advantageously formed by two tubes which can slide telescopically one inside the other and inside which a helical compression spring 113 is provided. The tubular part 109 is connected in non-displaceable manner with the cross member 108 by a flange 114 and an opposed retaining ring 115. The tubular part 112 fits in the cross member 110 and is retained thereby a setscrew 116. Inside the feed guide 103 there is provided a guide mandrel 117 on which the helical compression spring 113 is guided. It is thereby ensured that the spring 113 occupies the proper central position precisely in the vicinity of the tubular part 109. To ensure that no difficulties arise in the displacement of the two tubular parts 109 and 112, the free end of the tubular part 112 is provided with a conically widened entry opening 118.

The two tubular parts 109 and 112 are mutually retained in a manner precluding relative rotation and, moreover, a stop limit is provided for maximum feed and return travel. For this purpose a screw 119 is inserted through the cross member 108, penetrates the tubular part 109 and engages a projecting pin 120 in a longitudinal slot 121 of the tubular part 112.

The delivery device 104 and the second cross member 110 may be made in one piece or may be securely connected with one another. However, in the illustrated example this delivery device 104 is formed as a separate component from the second cross member 110 and is mounted rotatably relative to this latter about the axis 107 of the screwing tool 101. As will be explained subsequently in detail, this offers the possibility, when required, of rotating the delivery device 104 relative to the drive part of the driving-in unit.

The second cross member 110 and a component 122 having the delivery device 104 are connected mutually rotatably *via* a cylindrical bearing body 123. This bearing body 123 is securely connected to the component 122 and with a cylindrical extension engages in a bore in the second cross member 110. Spaced apart on its outer periphery this extension has radial bores 124 into which a ball 125 arranged on the second cross member 110 can engage. A spring 127 loads the ball 125 and the preload can be adjusted by a setscrew 126. It is thereby ensured that during use the angular position set is maintained, even though adjustment of the angle set is possible in a relatively simple manner, since in the case th spring-loaded ball 125 is pushed back. Naturally, instead of bores 124 it would also be possible to provid corresponding det nt gro ves or detent cams. Instead of a ball 125 other spring-loaded locking members are possibl , e.g. pins. Th ball 125 and the spring 127 with the setscrew 126 could also be arranged ff-set by 180° in relation to the illustrati n in Figure 24, so that in particular accid ntal tightening r loosening f the screw is n t possibl after assembly with the tubular part 112.

As a result of the arrangement according to the invention of the two spaced apart cross members 108 and 110, the provision of a depth stop is also possible in simple manner. A depth stop 128 is arranged in the space between the two cross members 108 and 110 and, according to the setting of the depth stop 128, the two cross members can be moved away from one another to a greater or lesser extent. The simplest embodiment is formed by a screw 129 adjustable axially parallel to the screwing tool 101 and preferably fitted in the first cross member 108. This screw 129 may be provided, for example, with means for preventing rotation so that a set position is not varied even during use. With such an embodiment it would also be possible to choose a similar arrangement to that provided for the connection between the cross member 110 and the component 122.

Within the scope of the invention it is of course also possible to provide a depth stop on the tubular part 112 of the feed guide. For example, this could be a displaceable or rotatable ring, in which case it would then possibly be necessary to provide a thread on the tubular part 112.

In the delivery device 104 a delivery channel 130 is provided which has a continuous opening for a magazine strip 106 to be pushed through and has grooves extending as far as the vicinity of the screwing location and serving to guide in the screw head and the screw tip. Two stop members 131 and 132 are provided so as to establish the precise screwing position for the screw 105, the stop member 131 being disposed in the vicinity of the screw head 133 and the stop member 132 being disposed in the vicinity of the screw tip 134, e.g. in the vicinity of a drilling tip of a screw 105. The stop member 131 is arranged fixed in the component 122 and is formed integrally with the bearing body 123. Simple re-adjustment is thereby optionally possible for different sizes of screw head.

The stop member 132 is in the form of a displaceable pin, the rear end of which is engaged by a spring 136. This spring is retained in its contact position by a setscrew 137. The function of the stop member 132 will be explained in more detail later on. The stop member 132 may also take the form of a spring-loaded slide with a sloping abutment surface, which is necessary in particular for screws with the underside of the head relatively flat.

The delivery device 104 is provided with a longitudinal slot 138 in which an entrainment member 139 engages; the free nd of this latter projects into the delivery channel 130. This ntrainment member 139, which is also pr vided with an actuating head 140, is spring-loaded towards the axis 107 of the screwing tool 101. In its position nearest th ntry opening f th d liv ry channel 130, the entrainm nt member 139 can be retracted and/ r tilted back from th delivery channel 130 into an arresting position. This is also evident from the

section according to Figure 25. The delivery channel 130 is thus free for the admission of a magazine strip 106. After admission, the entrainment member 139 can then be pivoted back or pressed back into the operating position so that the magazine strip 106 is urged under spring-loaded towards the axis 107 of the screwing tool 101.

The entrainment member 139 is engaged by a helical tension spring 141 which is guided over a guide pulley 142 provided at the end of the delivery device 104 on the screwing-in side. A correspondingly greater spring length is thereby possible.

In order to facilitate easier admission of the magazine-supplied screws and thus also of the magazine strip 106, the delivery channel 130 is provided with a bevel or with a sloping portions 143 in the vicinity of the entry opening.

During use the driving-in unit is supported with the contact surface 144 on the corresponding structural part (wall, ceiling or floor), thereby making possible support over a large area and thus secure and correct screwing in.

It is clear from the above statements that the driving-in unit according to the invention can be small, manageable and also relatively short in construction, so that single-handed operation, satisfactory fixing performance and also non-tiring work is possible in a simple manner. As a result of the rotatable delivery device 104 (rotating magazine), work can be performed simply even in corners, that is corners of rooms, without it being necessary to turn the driving-in unit. Therefore, a driving-in unit of this type is suitable both for left and right-handed people, without structural modifications. As already stated, the component 122 and the cross member 110 may be made in one piece or these parts are securely connected to one another. However, this is only taken into consideration if the same type of use prevails without particular additional difficulties. The free space between the cross members 108 and 110 allows the screwing tools 101 to be changed simply and rapidly.

The feed for the magazine strip 106 provided in accordance with the invention is of very simple construction and also in its mode of operation and is thus not liable to failure. In other conventional ratchet feeds a series of additional mechanical parts is necessary, which not only render the screwing operating more difficult when pressing down but, of course, also substantially increase the weight of such a driving-in unit.

During a loading operation the delivery device 104 is turned into the desired position *via* the bearing body 123. By means of thumb pressure the entrainment member 139 is displaced with the actuating knob 140 towards the entry opening of the delivery channel 130 and is engaged in the arresting position (Figure 25). It is now possible for a magazine strip 106 to be inserted by hand into the delivery channel 130 until the head of the entrainment member 139 is visible from the rear side. By light thumb pressure the entrainment member 139 can now be engaged in the use position. The entrainment member 139 is now pulled by the spring 141 towards the axis 107. The first screw 105 is thereby applied with its head 133 against the stop member 131 and simultaneously the tip 134 of the screw 105 is pressed against the stop member 132. The driving-in unit is now loaded and ready to effect a screwing operation. Upon screwing-in, the screwing tool 101 is guided towards the screw 105 so that this screw 105 is then driven. The screwing operation takes place through the magazine strip 106 in which case, as a result of the choice of a suitable material, in practice no resistance opposes the operation. As soon as the screw head 133 arrives in the zone of the stop member 132, this stop member 132 is pressed back against the force of the spring 136 and, after the head 133 of the screw 105 has passed, it is applied against the screwing tool 101. After the screwing tool 101 has driven the screw 105 through the magazine strip 106 and the screwing operation is completed, the screwing tool 101 returns through the empty hole in the magazine strip 106 to the starting position. As soon as the screwing tool 101 has passed the stop member 132, the latter returns to its starting position so that the stop member 132 is again set for the next screw. As soon as the screwing tool 101 has then been withdrawn from the magazine strip 106, as a result of the spring loading the magazine strip 106 can be moved on until the next screw 10 is situated in the stop position. This procedure can now be repeated.

In the illustrated embodiment according to Figure 24, the delivery device, namely component 122, comprises a milled steel or aluminium part. It is possible here to effect a number of constructional variations. It would thus be possible for this component 122 to be simplified in design, e.g. as a sheet metal part, an injection-moulded plastics part a die-cast part etc. One possible cross-sectional shape for such a section is evident from Figure 29. The disposition of the stop members 131 and 132 could then be effected in like manner with corresponding structural means. The guidance and spring-loaded design of an entrainment member is also provided for in simple manner in such embodiments.

The delivery device 104, namely the entire component 122, is secured in detachable manner, so that different delivery devices can be installed in simple manner for certain sizes of magazine strip and screws. For this purpose it would also be possible to devise quick-change and quick-fastening arrangements, so that the same basic apparatus is suitable without protracted conversion work for a very wide variety of applications.

CLAIMS

1. A magazine strip for screws to be accurately located during delivery in a driving-in unit, with through holes spaced apart successively in the longitudinal direction of the magazine strip for the insertion of the screws, wherein the magazine strip, as a bending-resistant section member, is made from material which is compressible and/or abrad-

able and/ r can be broken off, and in axial direction of the through h les is of a thickness extending over several turns of thread.

2. A magazine strip according to Claim 1, wherein it consists of expanded polystyrene foam.

3. A magazine strip according to Claim 1 or 2, wherein the through holes have a free passage cross-section approximately corresponding to the core diameter of the screws to be inserted.

4. A magazine strip according to one of Claims 1 to 3, wherein, starting from the free passage cross-section of the through holes, radially outwardly directed grooves, recesses or the like are provided.

5. A magazine strip according to one of Claims 1 to 3, wherein arcuately extending slot portions are provided coaxially to the through holes for accommodating screws, which slot portions pass right through the thickness of the magazine strip.

6. A magazine strip according to one of Claims 1 to 3, wherein peripherally closed grooves extending coaxially to the through hole are provided, the depth of which grooves extending coaxially to the through hole are provided, the depth of which grooves corresponds only to part of the thickness of the magazine strip.

7. A magazine strip according to Claim 6, wherein the grooves are of wedge-shaped cross-section.

8. A magazine strip according to one of Claims 1 to 7, wherein between the through holes spaced apart successively there are provided transverse slots which extend transversely to the longitudinal extension of the magazine strip, which extend over at least a part of the width thereof.

9. A magazine strip according to one of Claims 1 to 8, wherein ribs, grooves, openings or projections are formed in or on at least one of the lateral boundary surfaces, the upper side and/or underside of the magazine strip.

10. A magazine strip according to Claim 1 or 2, wherein it is of rectangular cross-section, in which case the ratio of thickness to width is approximately 1:1.5, or it is of circular cross-section.

11. A magazine strip according to Claim 1 or 2, wherein the upper and/or lower boundary surface is formed as a longitudinally extending concave depression.

12. A magazine strip for screws substantially as herein described with reference to and as shown in the accompanying drawings.

13. A driving-in unit for use with screws delivered in a magazine strip as claimed in Claims 1 to 12, comprising a drivable screwing tool, a spring-loaded feed guide and a delivery device for the screws, the longitudinal central axis of which is aligned with the axis of the screwing too, wherein the parts of the feed guid which can slid on inside th oth r ar disp sed in *per se* known manner axially parallel to and at a distance from th screwing to l, and th driv unit f the screwing tool and a part of the feed guid are mounted r form d on a common first, freely projecting cross member, a second freely projecting cross member, provided at a distance from this first cross member and aligned parallel thereto, is securely connected t the other part of the feed guide and has a through bore for th screwing t ol, and the d livery device with a delivery channel for the screws held in a magazine strip, with stop surfaces and dogs and with a feed for the magazine strip, as well as an abutment surface for positioning the driving-in unit during use, are mounted or formed on this second cross member.

14. A driving-in unit according to Claim 13, wherein the delivery device is formed as a separate component from the second cross member and is mounted rotatably relative thereto about the axis of the screwing tool.

15. A driving-in unit according to Claim 13 or 14, wherein the second cross member and the component having the delivery device are mutually connected *via* a cylindrical bearing body which is securely connected to either the second cross member or the said component and is mounted rotatably on the other, this bearing body having peripherally spaced detent grooves, bores, cams or the like, in which engages a spring-loaded locking member, for example a pin ball or the like, disposed on the said other.

16. A driving-in unit according to Claim 13, wherein on at least one of the cross members there is provided an adjustable depth stop projecting into the space between the two cross members.

17. A driving-in unit according to Claim 16, wherein the depth stop takes the form of a screw which is adjustable axially parallel to the screwing tool, which is preferably fitted in the first cross member and which is preferably provided with means for preventing rotation.

18. A driving-in unit according to Claim 16, wherein the depth stop takes the forms of a ring which is displaceable or rotatable on a tubular part of the feed guide but which can be locked in position.

19. A driving-in unit according to Claim 13, wherein the delivery device in the vicinity of the screwing tool there are provided two spaced apart stop members for the delivered screws, one stop member being disposed in the vicinity of the head of a screw and the other stop member being disposed in the vicinity of the screw tip of the delivered screw and can be urged away from the screwing zone preferably under spring loading.

20. A driving-in unit according to any one of Claims 13 to 19, wherein the delivery device is provided with a longitudinal slot having an entrainment member engaging therein and projecting into the delivery channel, the entrainment member being spring-loaded towards the axis of the screwing tool.

21. A driving-in unit according to Claim 20, wh rein in its p sition associated with the ntry opening of the d livery device the entrainment member can be retracted and/or tilted back from the d liv ry channel into an arresting position.

22. A driving-in unit according to Claim 20 r 21, wherein the entrainment member is ngaged by a helical tension spring which is guided over a

guid pulley provided at the nd of the delivery device n the screwing-in side.

23. A driving-in unit according to any ne of Claims 13 to 22, wherein the deliv ry channel has a bevelled or sloping portion in the vicinity of the entry opening.

24. A driving-in unit substantially as herein described with reference to and as shown in the accompanying drawings.

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